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per unit of time—about a thirty-millionth part each year. This can not be precisely true, but I think it must be a better approximation than the hypothesis that this area has undergone no diminution at all. The results may err in either direction. Thus the rate of diminution may fluctuate; if it is now above the average the exponential relation would give too low a value for the earth's age, and *vice versa*. Whether the rate is actually above or below the average we have no means of discovering. Again it is wholly improbable that either intensity of decomposition or the average yield of sodium per square kilometer of sodiferous rocks has always been the same, and this yield may now exceed the mean or fall short of it.

It appears that Mr. Joly's linear relation between oceanic sodium and its increment must lead to an excessive estimate of the earth's age, at least when the increment is duly determined. Thus that method assigns a limit, a knowledge of which is very valuable as a check on other computations. On the other hand, the ages computed from his data by the exponential expression seem to me suspiciously low. Various trains of reasoning lead me, at least, to believe that 50 million years is not a maximum but a minimum age; if so and if the exponential hypothesis is applicable then Mr. Joly's datum for the annual sodium increment is too large.

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WASHINGTON, D. C.,

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BOTANICAL NOTES

RECENT STUDIES OF THE FUNGI

DR. J. J. DAVIS'S "Fourth Supplementary List of Parasitic Fungi of Wisconsin" in the *Transactions of the Wisconsin Academy of Sciences, Arts and Letters* adds many new hosts, many species not hitherto reported, and some species new to science. All of the latter are Fungi Imperfecti. With this may be noticed the same author's "Mycological Narrative of a Brief Journey through the Pacific Northwest" (in the same *Transactions*) in which we are reminded of the itineraries of

the earlier botanists, like Kalm and Pursch, or even the master traveling botanist, Linné, in which not only are we told of the plants observed and collected, but we are made delightfully aware of the botanist himself. Our younger botanists might profitably study the style of the paper before us.

In these days when all lichens are fungi, we may notice here L. W. Riddle's "Key to the Species and Principal Varieties of *Cladonia* occurring in New England," which appeared in *Rhodora* for November, 1909. It looks promising, and no doubt will be helpful to students.

Of quite a different nature is Professor Atkinson's paper on "Some Problems in the Evolution of the Lower Fungi," published in *Annales Mycologici*, 1909. It was first delivered as the presidential address before the Botanical Society of America. In a most ingenious manner the author argues for the origin of the Phycomycetes from the lower unicellular algae such as the Protococcoideae through Chytridiales, to Saprolegniales, etc. He discusses the "degenerative influence of parasitism" and comes to the conclusion that "there seems little in support of the theory." On the contrary, he builds up "a natural series from Chytridiales to the Oomycetes and Zygomycetes, showing progressive evolution of the vegetable body and sexual process." While the paper may not be conclusive, it is suggestive and should be read by every student of the lower fungi.

W. H. Brown, in a note on "Nuclear Phenomena in *Pyronema confluens*" in the Johns Hopkins University Circular, 1909, points out that "it seems probable that the fusion of the sexual nuclei originally took place in the ascogonium, but later was delayed until some point in the development of the ascogenous hyphae." In this way he suggests a reason for the disappearance of the functional sexual organs in many fungi.

Here may be mentioned several papers on the economic aspects of certain parasitic fungi; namely, H. T. Güssow's "Serious Potato Disease occurring in Newfoundland" (Bull. 63, Canadian Dept. Agric.), in which a

species of *Chrysophlyctis* is shown to be the cause of a canker of the tubers which has been very destructive in Europe and has now appeared in Newfoundland. It produces rough nodules which emerge from the "eyes" and enlarge and spread over the surface of the tubers. So too the botanist will find much of interest in R. E. Smith's "Report of the Plant Pathologist" in Bull. 203 of the California Experiment Station, including as it does discussions of pear blight, walnut blight, apricot diseases, brown rot, etc., with a list of plant diseases additional to those previously reported. One of the most useful of recent papers on plant diseases is Professor Heald's "Symptoms of Disease in Plants" in Bull. 135 of the University of Texas. While ostensibly addressed to "persons engaged in general farming," it will prove to be one of the most useful introductions to plant pathology available for the young botanist. Here in an orderly sequence the principal aspects of plant diseases are brought before the reader in a lucid text aided by excellent photographs which have been well reproduced in "half-tones." If the author would make an index to this paper, and have it cheaply bound it would be an excellent little book (of about 65 pages) for use in the classes in agriculture in the high schools.

NOMENCLATURE OF THE FUNGI

A YEAR ago twenty-six prominent American students of the fungi formulated "Motions for Additional Articles Relating to the Nomenclature of the Fungi to be presented at the International Botanical Congress at Brussels in May of the present year." The motions advocate (A) beginning mycological nomenclature with the "Systema Mycologicum" of Fries, 1821-1832; (B) the interpretation of the Friesian "tribes" of *Agaricus* as genera in the modern sense; (C) the making of a list of *genera fungorum conservanda*, in spite of the law of priority; (D) the application of the present rules as to generic names of monomorphic fungi; (E) the recognition and retention of the generic names of the "perfect form" of the pleomorphic fungi; (F) the ap-

plication of the present rules as to specific names of monomorphic fungi; (G) the recognition and retention of the specific names of the "perfect form" of the pleomorphic fungi, with certain modifying provisions. It is further "recommended" that authors add figures to their diagnoses; that they conform to Recommendations VIII.-XIV. of the Vienna Code; that they indicate type species in genera.

Quite recently there has come to hand a paper by Professor W. G. Farlow, entitled "A Consideration of the Species Plantarum of Linnaeus as a Basis for the Starting Point of the Nomenclature of Cryptogams," which shows conclusively the inadvisability of using the Linnaean work, for the fungi at any rate. While he does not pronounce definitely upon the matter, he shows some very good reasons for preferring the "Systema Mycologicum" of Fries. In passing he throws the weight of his authority in favor of a list of *genera conservanda*, saying "there is nothing illogical in this, and practically there are great advantages."

From the foregoing it may be fairly predicted what will be the outcome of the Brussels Congress, and for the most part it seems good to the present writer, who, while not daring to hope for a perfectly satisfactory code, is ready to accept the best that can be made now, while still hoping for its betterment in future congresses.

DESCRIPTIVE BOTANY OF THE FLOWERING PLANTS

DR. MILLSAUGH continues in Publication 136 of the Field Columbian Museum his "Praenuciae Bahamenses," this being No. II., and including a map of the Bahaman Archipelago, a list of the collectors, observations and descriptions of new species (the latter in Latin!), a list of native plant names, and an index to I. and II. From the index we learn that in the two parts three new genera and fifty-three new species or new combinations have been described.

J. N. Rose and J. A. Purpus describe "Three New Species of *Echeveria* from Southern Mexico" in the Contributions from

the U. S. National Herbarium (Vol. 13, pt. 2) illustrating the paper by five fine photographs.

Professor Aven Nelson's "Contributions from the Rocky Mountain Herbarium," VIII. (*Bot. Gaz.*, XLVII.), includes many new species from the deserts of southern Nevada and adjacent Arizona, collected by L. N. Gooding in 1905.

Dr. E. L. Greene has taken time enough from his historical studies to bring out a number of descriptive or critical papers, among which are "New Californian Asteraceae," "Some Western Caulescent Violets," "Two New Southern Violets," etc., in his Leaflets of Botanical Observation and Criticism (Vol. II.); and "Some *Thalictra* from North Dakota" in the *Midland Naturalist* (October, 1909). Three new species are described.

Professor W. L. Jepson's "Synopsis of the North American *Godetias*" (University of California Publications, Vol. 2, No. 16) is a careful and exhaustive study of the species of this Pacific coast genus. Seventeen species are recognized, of which six are new. A helpful plate accompanies the paper.

Another paper on cactuses—"Cactaceae of Northeastern and Central Mexico," by W. E. Safford (Smithsonian Report for 1908), adds materially to our knowledge of these interesting plants. The first twenty pages are devoted to a general discussion of the structure, morphology and classification of the cactuses at large, while the remaining eighteen pages are given to a synopsis of Mexican Cactaceae. Fifteen fine plates and twenty-four text figures make this a valuable paper for any one who wishes to learn about the Cactaceae.

Here we may briefly mention Professor Schaffner's "Pteridophytes of Ohio," which is in reality an excellent local manual of these plants; Professor Shimek's "Flora of Winne-shiek County" (Iowa), being a useful annotated list, with ecological discussions; Professor L. H. Harvey's "Floristic Composition of the Vascular Flora of Mount Katahdin, Maine," with analytic tables and discussions; and lastly Professor Ruth Marshall's "Vegetation of Twin Island" giving the results of

several summers' studies of a small island in Lake Spooner in northwestern Wisconsin. It contains a suggestion as to what may be accomplished scientifically while having a good outing.

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SPECIAL ARTICLES

THE SEX-DETERMINING CHROMOSOMES IN ASCARIS

In 1908 Professor Boveri observed in an especially large number of the fertilized eggs of *Ascaris megalocephala bivalens*, a small chromatin element which he had already previously seen, and thinking that it might be a sex chromosome, he suggested to Miss Boring that she should make an exact study of the chromatin conditions in this species. Though Miss Boring obtained important results,¹ she could not arrive at any positive conclusion concerning the significance of this element. In an appendix to Miss Boring's paper (*l. c.*), Professor Boveri concludes that this small chromosome in *Ascaris megalocephala* is a sex-determinant, and also reports the finding by himself and Gulick, of a heterochromosome in *Heterakis*, which behaves exactly like the heterochromosome in some hemiptera (type *Protenor*, of Wilson).

Following the suggestion of Professor Boveri, I have worked upon the spermatogenesis of *Ascaris megalocephala* and *Ascaris lumbricoides*. In the maturation divisions of the spermatogenesis of *Ascaris megalocephala*, which have been very accurately investigated by O. Hertwig and Braur, and also by Miss Boring, nothing has been observed hitherto of an independent chromatin element that could be interpreted as a heterochromosome. Boveri (*l. c.*) has offered as an explanation for this condition, that the heterochromosome here may be united with one of the large chromosomes. Studying a great number of males of *Ascaris megalocephala*, I have found one in which an independent heterochromosome can be followed throughout the whole maturation period and another in which it is present in

¹ *Archiv f. Zellforschung*, V. 4.